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Social support mediates the association of health literacy and depression among racially/ethnically diverse smokers with low socioeconomic status

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Abstract

Nearly half of U.S. adults have health literacy (HL) difficulties, and lack the ability to effectively obtain, process, and understand health information. Poor HL is associated with depression, yet mechanisms of this relation are unclear. This study examined whether social support mediated the relation between HL and depressive symptoms in 200 low-socioeconomic status (SES), racially/

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ethnically diverse smokers enrolled in cessation treatment. Mediation analyses were conducted using bootstrapping and controlling for SES and nicotine dependence. In simple mediation models, social support (Interpersonal Support Evaluation List [ISEL] total, subscales [Appraisal, Belonging, Tangible]) mediated the effect of HL on depression, such that lower HL was associated with lower perceived support, which predicted higher depressive symptoms (*p*s<.05). A multiple mediation model, with ISEL subscales entered simultaneously as mediators, was significant (*p*<.05) but only the Belonging subscale demonstrating independent significance (*p*<.05). Thus, social support may be a critical factor underlying the HL-depression relationship in low-SES, racially/ethnically diverse smokers.

Keywords

health literacy; depression; social support; health disparities; cigarette smokers

Cigarette smoking is the leading preventable cause of U.S. morbidity and mortality (American Cancer Society, 2011; Mokdad et al., 2004). While smoking prevalence has decreased in recent years, it remains high for certain populations, including those with low income and education, the unemployed, racial/ethnic minorities, and the mentally ill (Centers for Disease Control and Prevention, 2002; Hughes, 1996; Lasser et al., 2000; Reid et al., 2010; Wetter et al., 2005). These smokers are less likely to successfully quit, and have limited access to cessation resources (Honjo et al., 2006; Vidrine et al., 2009a, 2009b). Further, those with low socioeconomic status (SES) and racial/ethnic minorities are at risk for both lower health literacy (HL; Dewalt et al., 2004; Kutner et al., 2005; Kutner et al., 2007) and chronic, persistent depression (Kessler et al., 2003; Lorant et al., 2003), which may put them at greater risk for cancer disparities. This study examined the link between HL and depression and mechanisms of this relation among low-SES, racially/ethnically diverse smokers.

HL is the degree to which one has the ability to obtain, understand, and use health information to make decisions about healthcare (United States Department of Health and Human Services, 2000). Roughly half of U.S. adults have difficulty with HL (Kutner et al., 2006). Lower HL is associated with poor health outcomes (for a review, see Berkman et al., 2011) and premature mortality (Coleman et al., 1999; Peterson et al., 2011). Those with lower HL have higher chronic illness prevalence (Michielutte et al., 1999) and are more likely to engage in unhealthy behaviors such as cigarette smoking (Adams et al., 2013; Stewart et al., under review). They also have lower health risk and illness-related knowledge (Gazmararian et al., 2003; Stewart et al., 2013), and are less likely to participate in cancer screening, resulting in more frequent diagnosis of advanced-staged cancer (Ramirez et al., 1999).

In addition to being associated with poor health behaviors and outcomes, low HL is associated with poor mental health, particularly depression (Bennett et al., 2007; Coffman & Norton, 2010; Howard et al., 2006; Lincoln et al., 2006; Morris et al., 2006; Sudore et al., 2006; Walker et al., 2007). Depression is the third leading cause of global disease burden (World Health Organization, 2008), affecting nearly 7% of U.S. adults each year (Kessler et

al., 2005). Similar to individuals with poor HL, those with low income, education, and employment are more likely to report depressive symptoms (Kessler et al., 2003; Lorant et al., 2003). While non-Latino Whites typically experience higher current and lifetime depression, Blacks tend to report more chronic, persistent symptoms of depression (Lorant et al., 2003).

Substantial evidence supports an association of depression with negative health behaviors and poor overall health (Moussavi et al., 2007). Specifically, depression is linked with poor diet, physical inactivity, higher smoking prevalence and poor cessation outcomes (Glassman et al., 2001; Glassman et al., 1990; Strine et al., 2008; Teychenne et al., 2010). Further, depressed individuals are often non-adherent to medical treatments, less likely to engage in cancer screening, and more likely to have poor health outcomes including premature mortality (i.e., cardiovascular disease, cancer; DiMatteo et al., 2000; McGee et al., 1994; Vigod et al., 2011).

The relation between poor HL and depression has been documented among the elderly (Gazmararian et al., 2000; Howard et al., 2006; Sudore et al., 2006; Walker et al., 2007), recent immigrants (Coffman & Norton, 2010), pregnant women (Bennett et al., 2007), and those with chronic illness (Kalichman et al., 1999; Morris et al., 2006; Walker et al., 2007) and problematic substance and alcohol use (Lincoln et al., 2006). This research is germane because poor HL and depressive symptomatology are independently associated with decreased healthcare utilization, and poor health status and outcomes (Berkman et al., 2011; Moussavi et al., 2007). It is therefore likely that difficulties with HL and co-occurring depressive symptoms might result in further health-related barriers, thereby contributing to SES and racial/ethnic health inequities. Notably, most studies have not sufficiently controlled for potential confounds (e.g., sociodemographic variables) or investigated possible mechanisms of this relationship.

Lower social support is one factor that might underlie the relation between low HL and depression. Greater social support is associated with improved physical and psychological health; lower depressive symptoms; and decreased mortality (Cohen et al., 2000; George et al., 1989; Holt-Lunstad et al., 2010; Uchino, 2006). It also predicts health-promotion behaviors (Fiore et al., 2008; Heaney & Israel, 2008; Stewart et al., 2012; Wing & Jeffery, 1999).

Research has investigated relations among HL, social support, and health (Arozullah et al., 2006; Gazmararian et al., 2000; Johnson et al., 2010; Lee et al., 2006), but only one known study has explored associations among HL, social support, and depression (Gazmararian et al., 2000). This study found that among Medicare enrollees, those with lower HL were twice as likely as those with higher HL to report depressive symptoms. This relation was explained by poor health status, poorer health behaviors, and lower perceived social support. These findings suggested that social support might function as a key mechanism through which HL impacts depressive symptomatology among the older adults (Gazmararian et al., 2000).

Individuals with poor HL often report guilt or shame about their difficulties with reading and understanding health information and, thus, many do not tell family, friends, or healthcare providers about these problems (Johnson et al., 2010; Parikh et al., 1996). This sense of shame may lead to a perceived lack of control or a sense of helplessness with regard to their literacy difficulties. This sense of helplessness may lead individuals to perceive that they have less available social support which may, in turn, lead to elevated symptoms of depression. This hypothesis is consistent with Seligman's theory of learned helplessness (Maier & Seligman, 1976; Seligman, 1975). Learned helplessness is a phenomenon in which individuals learn to behave helplessly in response to unpleasant events or situations, even when there are opportunities to avoid or escape them (Seligman, 1975). This theory posits that depression arises from perceived lack of control over events or circumstances (Maier & Seligman, 1976). Thus, it is conceivable that those with poor HL might perceive less available social support, which may lead to increased symptoms of depression.

Current Study

This study examined social support as a mediator of the association between HL and depression among low-SES, racially/ethnically diverse smokers enrolled in cessation treatment. Our strategy was to use simple mediation to investigate whether social support (total and subscale scores) mediated the effect of HL on depressive symptoms. Then, we planned to test subscales that significantly mediated this association in a multiple mediator model to test whether indirect effects occurred for the whole model or specific subscales. We hypothesized that participants with lower HL would report more severe depressive symptoms and that social support would mediate this relationship such that poor HL would be associated with lower perceived support, which would result in higher depressive symptoms. We had no specific hypotheses regarding specific subscales for the multiple mediator model. Elucidating social support as a key mechanism of the association between HL and depressive symptoms among smokers preparing to quit could ultimately be useful in informing smoking cessation interventions targeting this vulnerable population of smokers, thereby reducing tobacco-related health disparities. We were interested in exploring these relations among low-SES, racially/ethnically diverse smokers because this population is at elevated risk for experiencing difficulty with HL, social support, and depression. Further, it was expected that the time of enrollment in smoking cessation treatment would represent a time when smokers would be particularly prone to experiencing affective vulnerability.

Method

Participants

Participants (N = 200) were smokers enrolled in a larger smoking cessation treatment study designed to investigate real-time changes in smoking risk perceptions. Eligible participants were current daily smokers (smoked ≥5 cigarettes per day during the last year), had an expired carbon monoxide level of ≥8 parts per million, and were between the ages of 18 to 65. Exclusion criteria were: contraindication for nicotine patch use, current diagnosis of substance abuse or dependence, use of nicotine replacement therapy or bupropion products other than the nicotine patches provided by the study, regular use of tobacco products other

than cigarettes, enrollment of other household members in the study, and pregnancy or lactation.

Procedure

Interested smokers were contacted by phone and given a detailed description of the study. Then, smokers provided verbal informed consent and were screened for eligibility. Eligible participants were scheduled for in-person orientation visits during which the study was further described, written consent was obtained, eligibility was finalized, and baseline measures were completed. Baseline measures assessed demographics, HL, smoking characteristics and nicotine dependence, depressive symptoms, and social support. Analyses for the current manuscript utilized only baseline measures. All measures were administered in private interview rooms via the Questionnaire Design System (QDS), a computer-administered self-report interview system that includes audio and visual scripts (i.e., participants hear and read questions). Procedures were approved by our Institutional Review Board.

Measures

Demographics and smoking characteristics—Demographics assessed included age, gender, race/ethnicity, total annual household income, education, employment, and relationship status. Categorizations were as follows: income (<$30,000 vs. ≥$30,000 per year), education (< high school degree vs. ≥ high school degree/GED), employment (employed vs. not employed), and relationship status (married/living with a partner vs. not married/not living with a partner). Because the vast majority of participants were non-Latino White or Black (96%; see Table 1), race/ethnicity was categorized as non-Latino White, Black, and Other. Smoking characteristics included current and past smoking, prior quit attempts, self-reported cigarettes smoked per day (CPD), and time to first cigarette upon waking (TTFC). CPD and TTFC comprise the heaviness of smoking index (HSI), a good indicator of nicotine dependence (Kozlowski et al., 1994). Higher dependence is associated with lower HL (Stewart et al., 2013) and depression (Breslau et al., 1991).

Health literacy—HL was assessed with the Short Test of Functional Health Literacy in Adults (S-TOFHLA; Baker et al., 1999). The S-TOFHLA includes two timed parts: reading comprehension (36 items worth 2 points each) and numeracy (4 items worth 7 points each). Reading comprehension is assessed at the 4^{th} and 10^{th} grade levels using a modified cloze procedure where every fifth to seventh word is omitted. Readers choose the word that best fits each missing space from four possible choices. Numeracy items measured participants' ability to comprehend hospital forms and prescription labels. The sum of both sections (comprehension and numeracy) yields the total S-TOFHLA score, which ranges from 0-100. Scores from 0 to 53 indicate inadequate HL, scores from 54-66 indicate marginal HL, and scores from 67 to 100 indicate adequate HL. The reading comprehension section of the S-TOFHLA has demonstrated excellent internal consistency (α = .97) and the numeracy section has shown acceptable internal consistency (α = .68; Baker et al., 1999). Regarding validity, the S-TOFHLA is positively correlated with the Rapid Estimate of Adult Literacy in Medicine and the Wide Range Achievement Test (Baker et al., 1999).

Social support—Social support was measured using the 12-item, Interpersonal Support Evaluation List (ISEL; Cohen et al., 1985). The ISEL assesses respondents' perceived availability of functional social support. It yields a total score and has three subscales: Appraisal (i.e., availability of emotional support), Belonging (i.e., availability of companionship), and Tangible (i.e., availability of material aids). The ISEL has demonstrated good to excellent reliability in prior studies, with Cronbach's alphas ranging from .88 to .90 for the total score and α = .71 to .84 for the subscales (Cohen et al., 1985). In the current study, the ISEL total score and subscales displayed good internal consistency (α tanged from .72 to .88). The ISEL has shown good validity, and is positively correlated with other social support scales such as the Inventory of Socially Supportive Behaviors and the Partner Adjustment Scale (Cohen et al., 1985). The ISEL is also predictive of physical and mental health outcomes (Carpenter et al., 2010).

Depressive symptoms—Depressive symptoms were assessed using The Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977), a 20-item self-report measure of depressive symptomatology. Scores range from 0 to 60, with higher scores indicating more severe depressive symptoms. The CES-D has demonstrated good internal consistency in prior research, with Cronbach's alpha coefficients ranging from .85 to .90 across diverse populations (Breslau, 1985; Orme et al., 1986; Radloff, 1977). In the present study, the CES-D showed excellent internal consistency (α = 0.92). The CES-D has also shown good validity, and is positively correlated with clinician ratings of depression (Hamilton Rating Scale) and self-report measures such as the State Trait Anxiety Inventory (Orme et al., 1986; Radloff, 1977). Prior research suggests that the CES-D is predictive of smoking relapse (Kinnunen et al., 1996).

Statistical Analyses

This study examined the total effect of HL on depressive symptoms (i.e., the *c* path; Figure 1), and the indirect effects of HL on depressive symptoms through social support (i.e., the *ab* paths; Figure 1). Figure 1 shows the conceptual model. First, descriptive analyses and bivariate correlation analyses were conducted to investigate relations among HL, SES variables, smoking characteristics, social support, and depressive symptoms. Then, bootstrapping was used to test for mediation. Bootstrapping is a nonparametric resampling procedure that produces an empirical approximation of the sampling distribution of the product of the estimated coefficients in the indirect paths with the use of 5,000 resamples in the data set (Preacher & Hayes, 2008). Analyses were conducted with IBM SPSS 19 using an INDIRECT macro [Y. Cao personal communication with A. F. Hayes, 16 March 2009]. Each potential mediator variable (ISEL total and subscale scores [Appraisal, Belonging, Tangible]) was tested in simple mediation models adjusting for SES-related variables (i.e., age, gender, race/ethnicity, education, income, employment, relationship status) and nicotine dependence (i.e., HSI). Subscale scores that were statistically significant mediators were tested simultaneously in a multiple mediator model using the same SPSS INDIRECT macro. The advantage of using multiple mediation is that it allows for the teasing apart of individual mediating effects that may be due to having several mediators that overlap in content (Preacher & Hayes, 2008; West & Aiken, 1997). Bias corrected and accelerated (BCa) 95% confidence intervals (CI) were calculated to test for significant indirect effects. Indirect

effects were significant ($p < .05$) if the value of zero was not included within the BCa 95% CI (Preacher & Hayes, 2004). Proportion of the mediated effect (PME) was calculated using the following formula: PME = $ab/(c'+ab)$ (MacKinnon et al., 2007). It is important to note that these analyses utilized cross-sectional data, and as a result, causation can only implied. Furthermore, when we refer to "mediation," we mean that results are consistent with mediation.

Results

Participant Characteristics

Participants (N = 200) were primarily female (58%) and non-Latino White (51%), with an average age of 46.1 years (SD = 9.7). The mean S-TOFHLA score was 91.3 (SD = 8.5) and the mean CES-D score was 15.4 (SD = 11.0). A score of 16 on the CES-D indicates significant mild depressive symptoms (Radloff, 1977); 43% met this cut-off. Regarding smoking, participants reported smoking 21.2 CPD (SD = 9.6). See Table 1.

Bivariate Associations

Relations among HL, SES-related characteristics, smoking characteristics, social support, and depressive symptoms were explored using bivariate correlation analyses. Participants with lower HL were more likely to be Black ($p < .05$), unemployed ($p < .05$), and have lower income ($p < .05$) and education ($p < .05$). Lower HL was also associated with lower perceived social support ($p < .01$) and elevated depressive symptoms ($p < .01$). Participants with higher nicotine dependence were more likely to be non-Latino White ($p < .05$), older in age ($p < .05$), unemployed ($p < .05$), and have lower education ($p < .05$).

Mediation Analyses

Simple mediation, adjusted to control for SES and nicotine dependence, indicated a significant total effect (c) between HL and depression, such that lower HL was associated with more severe depressive symptoms ($p < .05$). HL was significantly associated with social support (a), as measured by the ISEL total score and all three subscale scores (ps < .05), such that lower HL was associated with lower perceived social support. The association between social support (ISEL total and subscale scores) and depressive symptoms (b) were significant when controlling for HL (ps < .001), indicating a relation between lower perceived support and higher depressive symptoms. The direct effect of HL on depression (c') was not significant, suggesting that social support (i.e., total score, all 3 subscales) mediated the association between lower HL and elevated depressive symptoms (see Table 2).

After testing simple mediation models, a multiple mediator model controlling for SES and nicotine dependence was tested, with all three ISEL subscales entered simultaneously to allow for the investigation of the indirect effects of the subscales on depressive symptoms while controlling for the effects of the other subscales. Total mediation effects were significant ($p < .05$). In the multiple mediator model only the Belonging support subscale was significant ($p < .05$; see Table 3), suggesting that this subscale represents the most cogent mediator variable.

Discussion

This study investigated associations between HL and depression and tested social support as a mediator of this relation in a sample of low-SES, racially/ethnically diverse smokers preparing to quit. As hypothesized, lower HL was associated with elevated symptoms of depression, and lower social support significantly mediated this relationship. Multiple mediation results indicated that the Belonging support subscale accounted for most of the observed effect. Identifying factors underlying the relation between lower HL and depressive symptomatology in smokers, particularly those with low SES and racial/ethnic minorities, is critical given that individuals from these backgrounds are at risk for experiencing difficulties with HL, chronic and persistent depression, and tobacco-related health disparities.

In the current study, research results revealed that lower HL was associated with elevated depressive symptoms. These findings are consistent with prior research suggesting that individuals with lower HL are more likely to experience symptoms of depression (Bennett et al., 2007; Coffman & Norton, 2010; Howard et al., 2006; Lincoln et al., 2006; Morris et al., 2006; Sudore et al., 2006; Walker et al., 2007). Our findings meaningfully add to the existing literature given that participants were low-SES, racially/ethnically diverse smokers enrolled in smoking cessation treatment. Substantial research indicates that individuals with low education, income, and employment status, and racial/ethnic minorities are at risk for poor HL (Dewalt et al., 2004; Kutner et al., 2005; Kutner et al., 2007), chronic and persistent depression (Kessler, 2003; Lorant et al., 2003), and poor smoking cessation outcomes. Notably, in the present study, the observed significant associations held after controlling for SES-related factors. This suggests that poor HL may be an independent risk factor for depression, above and beyond race/ethnicity and SES-related factors. Future studies should examine how HL and depression might impact cessation outcomes among low-SES, racially/ethnically diverse smokers.

Results from simple mediation models indicated that social support (total and subscale scores) mediated the HL-depression association. That is, lower HL was associated with lower perceived support, which predicted elevated depressive symptoms. Prior research has found that individuals with poor HL report experiencing shame or guilt due to their HL difficulties, and that they often hide these problems from family, friends, and healthcare providers (Johnson et al., 2010; Parikh et al., 1996). Thus, those with lower HL may experience isolation and perceive less available support, which might contribute to depressed mood. One study found that in Medicare enrollees, lower HL was associated with elevated symptoms of depression and that lower support partially explained this association (Gazmararian et al., 2000). Our study supports and extends this research, as it is the first known study to find that social support underlies the relationship between lower HL and depression in a younger sample of low-SES, diverse smokers.

To tease out the effects of social support on the HL-depression relationship, we conducted multiple mediation analyses with all three ISEL subscales (i.e., Appraisal, Belonging, Tangible) entered simultaneously into the model. Total mediation effects were significant, but the only significant individual indirect effect in the multiple mediator model was

represented by respondents' scores on the Belonging support subscale, suggesting that this subscale represents the most cogent mediator variable. Belonging support is a type of functional support, conceptualized as the function provided by social relationships (Uchino, 2004). Belonging support in particular, is defined as the perceived availability of others with whom to engage in social activities (Cohen et al., 1985; Uchino, 2004). An example item from the ISEL Belonging subscale is "If I wanted to go on a trip for a day (for example, to the country or mountains), I would have a hard time finding someone to go with me." Uchino (2004) noted that belonging support is critical because engaging in social and leisure activities improves individuals' mood and sense of acceptance by others. Given that individuals with lower HL frequently experience shame and embarrassment about their HL difficulties and do not tell others about these problems (Johnson et al., 2010; Parikh et al., 1996), it makes intuitive sense that those with lower HL would perceive less belonging support, rather than tangible (the availability of goods or services) or appraisal (the available of emotional support) types of social support. Nevertheless, further research is needed to elucidate if certain types of social support might be more helpful for individuals with poor HL.

Understanding more about mechanisms underlying the association of HL and depression among low-SES, diverse smokers may help inform interventions for smoking cessation and other health behavior change for individuals with poor HL. In light of the present results, interventions targeting those with lower HL should include strategies to enhance social support. Specifically, those with lower HL may benefit from eliciting social support from their family and friends, and involving supportive family or friends in treatment. They also may benefit from group treatment, which might normalize their HL difficulties, thereby reducing shame. Interventions should also address the presence of depressive symptoms. Overall, these strategies may result in healthier behaviors, particularly smoking cessation, thus reducing health disparities. Finally, interventions focused on improving HL should continue to be developed and evaluated.

Limitations and Future Directions

The present study has several limitations. First, this preliminary investigation relied on cross-sectional data. Although these results are useful for generating hypotheses, they do not necessarily imply causality and should be interpreted with caution. Longitudinal studies are needed to clarify the temporal nature of relations among HL, social support, and depression. Further, this study only examined social support as a mediator of the relationship between HL and depressive symptomatology. Other possible mediators (e.g., stress, shame, discrimination) and moderators (e.g., race/ethnicity) should be explored in future research. In addition, the current results might be limited by a restriction of range of HL as measured by the S-TOFHLA. As most participants fell in the "adequate" range, correlations might underestimate relationships among HL and SES, smoking characteristics, depressive symptoms, and social support. This study is also limited in its reliance on self-report measures, which can be biased. Finally, participants were treatment-seeking smokers and were recruited only from Houston, TX, which might limit the generalizability of the findings. Studies should replicate and extend this research with other samples in diverse

settings, and investigate how associations between HL, depression, and social support influence smoking and cessation outcomes.

Conclusions and Implications

Limitations notwithstanding, this study found that among low-SES, racially/ethnically diverse smokers preparing to quit, lower HL was associated with elevated symptoms of depression, and that lower social support mediated this relationship. Thus, social support may function as a key mechanism through which HL impacts the severity of depressive symptoms. Additionally, type of social support (i.e., the perceived availability of companionship) appeared to play an important role in mediating the association between HL and depressive symptoms. Further research is needed to investigate relations among HL, social support, and depression throughout the process of quitting smoking, as it is possible that these relationships might impact cessation outcomes. Longitudinal research is needed to determine how associations among these variables might change over time. These findings would be useful in informing and developing cessation strategies specifically for smokers with poor HL, as low HL appears to increase vulnerability to poor health behaviors and poor health outcomes, even after accounting for the effects of SES and nicotine dependence. Healthcare providers should be trained to communicate clearly about the health risks of smoking and to offer treatments that do not require high HL, using techniques such as the teach-back method and one-on-one teaching, and visual educational materials should be modified to include less text and more pictures to ensure that all individuals understand, regardless of their HL level (Kripalani & Weiss, 2006; Williams et al., 1998). Smoking cessation interventions that focus on increasing the quality and quantity of certain types of social support for smokers with co-occurring depression may result in reduced depressive symptoms and improved smoking cessation outcomes. Research is also needed to investigate whether these associations remain among non-smokers.

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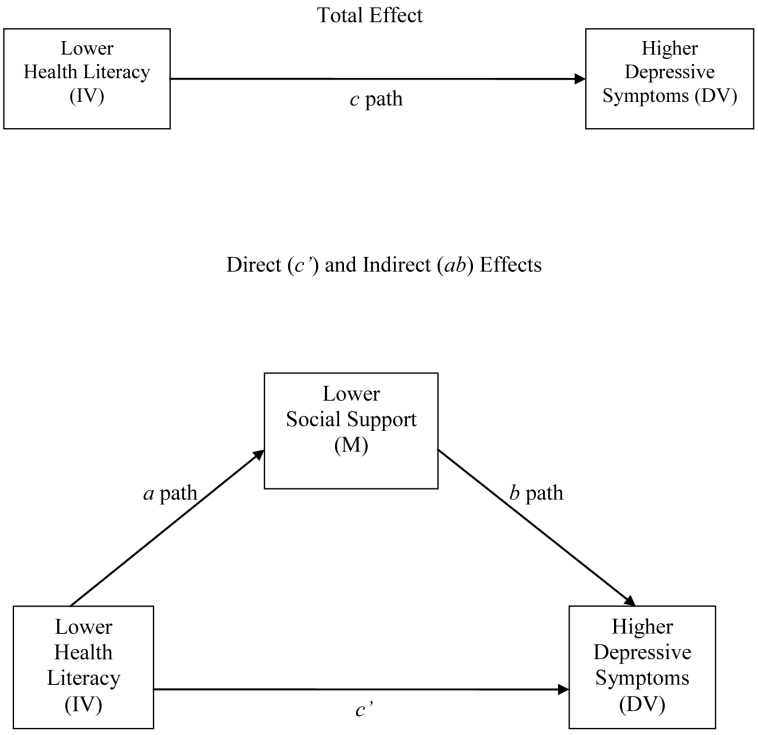

Figure 1.

Hypothesized conceptual model of the total effect of HL on depression and the indirect effect of HL on depression through proposed social support mediators.

Note. All variables were measured at baseline.

Table 1

Participant Characteristics

Variable	Mean (*SD*)/Percentage	*n*
Sociodemographics		
Age (years; range 21-65)	46.1 (9.7)	200
Race		
Non-Latino White	51.0	102
Black	44.5	89
Other	4.5	9
Gender		
Female	57.5	115
Male	42.5	85
Total Annual Household Income		
< $30,000	57.0	114
≥ $30,000	43.0	86
Educational Level		
≤ High School degree/GED	32.0	64
> High School degree/GED	68.0	136
Employment Status		
Employed	52.0	104
Unemployed	48.0	96
Relationship Status		
Married/Living with Partner	29.0	58
Not married/Living with Partner	71.0	142
Health Literacy (S-TOFHLA)	91.3 (8.5)	200
Inadequate (0-55)	0.5	1
Marginal (56-66)	2.0	4
Adequate (67-100)	97.5	195
Depressive Symptoms (CES-D)	15.4	200
Smoking Characteristics Cigarettes per day	21.2 (9.56)	200
Time to first cigarette of day		
≤ 5 minutes after waking	40.50	81
> 5 minutes after waking	59.50	119

Note. S-TOFHLA = Short Test of Functional Health Literacy. CES-D = The Center for Epidemiologic Studies Depression Scale.

Table 2

Summary of Single Mediator Model Analyses: Bootstrapped Estimates, Confidence Intervals, and Explained Variances for the Tests of Indirect Effects

Independent Variable (IV)	Mediating Variable (M)	Dependent Variable (DV)	Effect of IV on M (a)	Effect of M on DV (b)	Direct Effect (*c'*)	Indirect Effect (a × b), BCa 95% CIs	Total Effect (c)	PME
S-TOFHLA	ISEL Total Score	CES-D	.16 (.06)**	−.66 (.11)***	−.09 (.09)	−.20 to -.04	−.20 (.09)*	54.1 %
	Appraisal Subscale		.06 (.02)*	−1.28 (.26)***	−.12 (.09)	−.15 to -.02	−.20 (.09)*	35.1 %
	Belonging Subscale		.05 (.02)*	−1.67 (.29)***	−.12 (.09)	−.16 to -.02	−.20 (.09)*	39.4 %
	Tangible Subscale		.06 (.02)**	−1.47 (.30)***	−.11 (.09)	−.17 to -.03	−.20 (.09)*	43.8 %

Note. Values are point estimates with standard errors in parentheses. BCa 95% CI = bias-corrected 95% confidence interval. PME = Proportion of the Mediated Effect. S-TOFHLA = Short Test of Functional Health Literacy. ISEL = Interpersonal Support Evaluation List. CES-D = The Center for Epidemiologic Studies Depression Scale. Analyses are adjusted for demographics and SES-related characteristics (i.e., age, gender, race/ethnicity, education, income, employment, relationship status) and nicotine dependence.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 3

Summary of Multiple Mediator Model Analysis: Bootstrapped Estimates, Confidence Intervals, and Explained Variances for the Tests of Indirect Effects

Independent Variable (IV)	Mediating Variable (M)	Dependent Variable (DV)	Effect of IV on M (a)	Effect of M on DV (b)	Direct Effect (*c'*)	Indirect Effect (a × b), BCa 95% CIs	Total Effect (c)	PME
S-TOFHLA	All Subscales	CES-D			−.10 (.09)	−.20 to -.03	−.20 (.09)*	51.8%
	Appraisal Subscale		.06 (.02)*	−.53 (.33)	−.10 (.09)	−.10 to .00	−.20 (.09)*	-
	Belonging Subscale		.05 (.02)*	−1.10 (.39)**	−.10 (.09)	−.13 to -.01	−.20 (.09)*	25.8%
	Tangible Subscale		.06 (.02)**	−.36 (.42)	−.10 (.09)	−.09 to .02	−.20 (.09)*	-

Note. Values are point estimates with standard errors in parentheses. BCa 95% CI = bias-corrected 95% confidence interval. PME = Proportion of the Mediated Effect. S-TOFHLA = Short Test of Functional Health Literacy. ISEL = Interpersonal Support Evaluation List. CES-D = The Center for Epidemiologic Studies Depression Scale. Analyses are adjusted for demographics and SES-related characteristics (i.e., age, gender, race/ethnicity, education, income, employment, relationship status) and nicotine dependence.

* $p < .05$.

** $p < .01$.

*** $p < .001$.